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AUTHOR Breland, Hunter M.
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ABSTRACT

Data were collected for a brief objective English test, the Test of Standard Written English (TSWE), and for subsequent essay writing performance in four institutions. Data were then pooled across the four institutions and subclassified into four groups: males, females, majorities, and minorities. The groups were then compared with respect to TSWE score distributions, correlations of TSWE scores with later performance in freshman English courses and regressions of essay scores on TSWE scores. Neither the correlational nor the regression analyses suggested any substantial differences in prediction among the groups. Statistically significant differences were obtained, however, between the slopes of the regression lines for males and females and between the intercepts of the regression lines for majorities and minorities. The regression lines thus indicated that females scoring high on the TSWE tended to write better essays than males scoring high on the TSWE. Conversely, low-scoring females tended to write worse essays than low-scoring males. The majority and minority regression line comparisons indicated that, for the same TSWE score, majorities tended to write better essays than minorities throughout the range of TSWE scores. However, these differences were not of sufficient size to be of any practical significance. (Author/CTM)

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Sex and Ethnic Comparisons of Test Validity*

Using a Blind-scored Essay as a Criterion

Hunter M. Breland

Educational Testing Service

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In introducing evidence for or against test bias or in introducing reviews of the literature on test bias studies (e.g., Linn, 1973), one often notes a caveat something like the following: All that follows is based upon the assumption that the criterion is not biased. Obviously, that is a pretty hefty assumption and, accordingly, one does not know just what to make of what is said in the rest of the paper.

Because of this state of affairs, I decided to attempt a study in which the possibility of criterion bias was removed, or at least substantially alleviated. This was accomplished by using an essay criterion for the validation of a brief test of writing ability (The Test of Standard Written English). The essays were independently scored by two experienced English teachers and their ratings summed for each essay to produce the criterion score. The English teachers who did the scoring were unknown to the English teachers who collected the essay data (and vice-versa). This does not mean that all possible bias has been removed, since it may be possible on occasion to detect from handwriting styles or usage the sex or ethnic status of the writer. Nevertheless, the most obvious sources of criterion bias are removed by the double-blind procedure.

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Data and Methods

The four institutions participating in the 1975-76 study provided data on 9,144 students identified by sex and 7,718 students identified by ethnic status. This total included 5,162 males, 3,982 females, 6,839 majorities, and 879 minorities. The 879 minorities consisted of 21 American Indians, 683 Blacks, 8 Mexican-Americans, 134 Asian-Americans, and 33 Puerto Ricans. Over 2,500 samples of writing were obtained, and most of these could be compared with TSWE scores for the same students. Bivariate distributions were generated for each of the four groups of interest. Correlational tables were developed for each of the four groups and regression analyses were conducted.

Analyses of Distributions

Tables 1, 2, 3, and 4 present a comparison of TSWE scores and essay scores for the four groups.[1] The essays were scored by the two different readers on a scale from 1 (poor) to 6 (good). The two independent scores were then added to yield an essay score scale from 2 to 12. The average essay score fell between 6 and 7.[2] In Tables 1, 2, 3, and 4 scores of 7 or above were, therefore, classified as above average and a percentage computed of those students writing above average essays for each of the TSWE score ranges. The tables show that the percentage of students writing above average essays tend to decrease as the TSWE score decreases.

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[1] These TSWE scores were obtained at the time students took the SAT when applying for college. The essay scores were obtained during the freshman year of college.

[2] Further details of essay scoring procedures are given in Breland et. al (1976) and Breland (1977).

Table 1

TSWE/Essay Score Distributions for Male Students in Four Colleges During the 1975-76 Academic Year

TSWE (SAT) Score Range	Essay Score											
	12	11	10	9	8	7	% Above Average	6	5	4	3	2
Pre-course Essay Score Frequencies												
60+		1	1	1	1	1	62%	3				
55-59	1	4	10	13	7	11	82%	5	3	2		
50-54	2	3	4	7	18	10	68%	16	2	2	1	
45-49	1		2	6	11	14	59%	8	11	3	2	
40-44			1	5	10	6	48%	13	15	13	3	
35-39			1	4	8	9	41%	14	17	9	5	
30-34			1	1	2	4	11%	5	23	21	8	8
25-29					4	1	9%	5	16	13	12	4
20-24						1	2%	1	8	10	19	6
Post-course Essay Score Frequencies												
60+	1			4	1		86%		1			
55-59	1	3	8	9	15	8	80%	9	2			
50-54		4	5	17	9	13	70%	11	5	3	1	
45-49		4	7	6	11	12	73%	8	5	1	0	1
40-44	1	1	1	6	11	15	54%	12	10	6	1	1
35-39			2	8	9		46%	15	12	3	4	1
30-34		1		2	6	10	26%	20	17	9	5	2
25-29				1	5	5	24%	2	18	6	4	4
20-24					2	1	10%	5	6	4	8	3

Table 2

TSWE/Essay Score Distributions for Female Students in Four Colleges During the 1975-76 Academic Year

TSWE (SAT) Score Range	Essay Score											
	12	11	10	9	8	7	% Above Average	6	5	4	3	2
Pre-course Essay Score Frequencies												
60+	1	4	5	4	6	3	92%	2				
55-59	4	7	9	8	16	14	84%	6	5			
50-54	1	6	10	12	18	15	80%	8	5	2		
45-49			4	6	9	13	78%	3	4	1	1	
40-44		1	1	4	8	11	58%	12	51	1		
35-39		1		3	1	6	29%	9	12	4	2	
30-34					2	8	36%	8	5	5		
25-29			1				5%	7	6	5	2	
20-24						1	7%		3	7	4	
Post-course Essay Score Frequencies												
60+		5	6	4	5	2	92%	2				
55-59	3	7	11	11	19	7	89%	5	2			
50-54	4	5	12	13	10	12	80%	8	3	3		
45-49	1	3	4	4	9	8	69%	10	2			1
40-44			1	5	8	6	50%	14	3	2	1	0
35-39		1	3		4	8	44%	9	3	6	1	1
30-34				3	1	3	24%	7	6	3	4	2
25-29					2	1	15%	7	4	3	1	2
20-24							0%	3	6	2	2	3

Table 3

TSWE/Essay Score Distributions for Majority Students in Four Colleges During the 1975-76 Academic Year

TSWE (SAT) Score Range	Essay Score											
	12	11	10	9	8	7	% Above Average	6	5	4	3	2
Pre-course Essay Score Frequencies												
60+	1	5	5	5	6	4	90%	3				
55-59	3	9	15	16	19	21	81%	10	7	2		
50-54	3	9	12	13	25	20	74%	20	5	3		
45-49	1		4	9	16	21	65%	10	11	4	2	
40-44		1	2	6	12	10	41%	15	17	12	1	
35-39			1	7	5	11	34%	17	20	6	3	
30-34			1		1	6	17%	6	13	13	1	4
25-29					3	1	11%	5	14	10	4	
20-24						1	9%		2	6	1	2
Post-course Essay Score Frequencies												
60+		5	6	6	5	2	89%	2	1			
55-59	3	6	14	17	29	12	83%	12	4			
50-54	3	8	13	23	16	18	74%	17	7	4	1	
45-49	1	6	9	8	16	18	75%	10	7	1		1
40-44	1	1	2	8	13	19	57%	16	10	4	2	1
35-39		1	3	6	11	13	48%	19	7	6	4	
30-34				2	5	9	31%	13	10	7	3	2
25-29				1	4	4	27%	3	14	6		1
20-24					1		8%	2	4	2	2	1

Table 4

TSWE/Essay Score Distributions for Minority Students in Four Colleges During the 1975-76 Academic Year

TSWE (SAT) Score Range	Essay Score											
	12	11	10	9	8	7	% Above Average	6	5	4	3	2
Pre-course Essay Score Frequencies												
60+							0%					
55-59	1				1		100%					
50-54				3	2	1	67%	3				
45-49					2	3	62%		3			
40-44				1	3	5	64%	3		2		
35-39		1			1		13%	3	4	5	1	
30-34				1	3	2	22%	1	8	9	1	2
25-29							0%	2	3	5	2	2
20-24						1	4%		8	7	6	4
Post-course Essay Score Frequencies												
60+							0%					
55-59		1		1			100%					
50-54				1	1	3	62%	1	1	1		
45-49			1	1	2		50%	3				1
40-44				3	1	1	38%	3	1	4		
35-39			1		1	3	31%	3	5	2		1
30-34				2	1	2	18%	8	6	3	3	2
25-29						1	7%	4	1	2	2	5
20-24						1	4%	5	6	3	5	4

Hit and Miss Analyses

Hit and miss analyses were conducted considering hits of two types: (1) students scoring 40 or above on the TSWE and writing essays with scores of 7 or above, and (2) students scoring below 40 and writing essays with scores of 6 and below. Misses are then obtained from the opposite quadrants: (1) students scoring 40 or above on the TSWE but writing essays with scores of 6 and below, and (2) students scoring below 40 on the TSWE but writing essays with scores of 7 and above. The four-fold table will then be:

	Essay Score: 7 to 12	Essay Score: 2 to 6
TSWE $\geq$ 40	Hit	Miss
TSWE < 40	Miss	Hit

The ratio of hits to misses can be computed and these ratios compared for the four groups. From Tables 1, 2, 3, and 4, the following hit/miss tables are derived:

Males (514)

	Essay 7 to 12	Essay 2 to 6
TSWE $\geq$ 40	151	102
TSWE < 40	36	225

$H/M = \frac{376}{138} = 2.72$

Females (403)

	Essay 7 to 12	Essay 2 to 6
TSWE $\geq$ 40	200	101
TSWE < 40	23	79

$H/M = \frac{279}{124} = 2.25$

Majorities (681)

	Essay 7 to 12	Essay 2 to 6
TSWE $\geq$ 40	273	122
TSWE < 40	37	249

$H/M = \frac{522}{159} = 3.28$

Minorities (115)

	Essay 7 to 12	Essay 2 to 6
TSWE $\geq$ 40	22	11
TSWE < 40	9	73

$H/M = \frac{95}{20}$ 4.75

The proportion of misses for minorities is less than the proportion of misses for any of the other three groups:

	Proportion of Misses (Essays)
Males	.27
Females	.31
Majorities	.23
Minorities	.17

In view of the dependence of these hit and miss analyses on the cutting score, regression analyses (which are independent of the cutting score) are in many ways preferable. Nevertheless, the hit and miss procedure shows specific outcomes when knowledge of the specific use of a test is known.

The proportion of misses above was based upon a cutting score of 40 for all four groups. Since the proportion of misses depends upon where the cutting score is set, it is of interest to compute the proportion of misses for all four groups at all possible cutting scores.

In Table 5, a TSWE cutting score of 45 minimized the proportions of misses for males, females, and majorities. The proportion of misses for minorities was minimized at a TSWE cutting score of 40. As for the course grade analyses, the outcome differences were not great in the minimum region. Consequently, a cutting score of 45 for all groups would have been appropriate.

Table 5

Proportions of Misses Based on Essay Outcomes

TSWE Cutting Score	Males (493)	Females (403)	Majorities (681)	Minorities (115)
60	.38	.50	.42	.27
55	.31	.38	.33	.25
50	.26	.27	.24	.23
45	.24	.21	.21	.21
40	.28	.31	.23	.18
35	.33	.35	.27	.27
30	.44	.36	.31	.40
25	.53	.41	.35	.52
20	.62	.45	.54	.73

If the cut is made at a TSWE score of 35, these tables and ratios are obtained:

Males (514)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 35	173	147
TSWE < 35	14	180

$H/M = \frac{353}{161} = 2.19$

Females (403)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 35	211	128
TSWE < 35	12	52

$H/M = \frac{263}{140} = 1.88$

Majorities (681)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 35	297	168
TSWE < 35	13	203

$H/M = \frac{500}{181} = 2.76$

Minorities (115)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 35	24	24
TSWE < 35	7	60

$H/M = \frac{84}{31} = 2.71$

The reduction of the cutting score from 40 to 35 decreases the hit/miss ratios for all groups.

Correlational Analyses

The correlational analyses of Tables 6, 7, 8, and 9 show the relationships between TSWE scores and essay scores in another way. Variable 5 is the TSWE score obtained when students took the SAT. Variable 10 is a TSWE test administered at the participating institutions toward the end of the first freshman English course. Variables 8 and 11 are scores obtained on the graded writing samples. The correlation between Variable 5 (TSWE) and Variable 11 (Essay Posttest) is .54 for males, .61 for females, .51 for majorities, and .49 for minorities. Similar comparisons can be made between Variables 5 and 8 and between Variables 8 and 11. For all groups, the TSWE Pretest tends to predict freshman writing performance as well as

Table 6

Correlation Matrix for Males in Four Colleges During the 1975-76 Academic Year

Variable Number and Description	Variable Number										
	1	2	3	4	5	6	7	8	9	10	11
1. High School Rank		4123	3226	3227	3227	4283	4283	479	2242	506	475
2. High School English Grade	.56		3267	3267	3267	4209	4209	458	2206	487	454
3. SAT Reading	.36	.35		3961	3961	3961	3961	462	2060	489	462
4. SAT Vocabulary	.34	.32	.77		3962	3962	3962	462	2061	489	462
5. TSWE (SAT)	.38	.36	.69	.69		3962	3962	462	2061	489	462
6. SAT-V	.37	.35	.95	.93	.74		5162	568	2667	604	567
7. SAT-M	.42	.25	.56	.56	.56	.60		568	2667	604	567
8. Essay Pretest	.31	.32	.55	.57	.62	.61	.42		537	514	538
9. College English Grade	.22	.21	.23	.20	.27	.24	.18	.28		576	539
10. TSWE Posttest	.38	.38	.69	.65	.81	.72	.55	.66	.28		530
11. Essay Posttest	.30	.26	.48	.48	.54	.49	.40	.48	.23	.54	

Note: Correlations below diagonal, number of cases above.

Table 7

Correlation Matrix for Females in Four Colleges During the 1975-76 Academic Year

Variable Number and Description	Variable Number										
	1	2	3	4	5	6	7	8	9	10	11
1. High School Rank		3375	2532	2532	2532	3349	3349	372	2016	362	366
2. High School English Grade	.56		2580	2580	2580	3414	3414	374	2037	359	364
3. SAT Reading	.41	.36		3051	3051	3051	3051	357	1835	347	342
4. SAT Vocabulary	.39	.34	.75		3051	3051	3051	357	1835	347	342
5. TSWE (SAT)	.44	.39	.69	.68		3051	3051	357	1835	347	342
6. SAT-V	.43	.37	.94	.93	.74		3982	439	2343	423	423
7. SAT-M	.48	.32	.59	.58	.60	.62		439	2343	423	423
8. Essay Pretest	.33	.33	.53	.53	.60	.51	.46		417	381	404
9. College English Grade	.12	.09	.25	.22	.25	.26	.22	.27		409	409
10. TSWE Posttest	.55	.50	.73	.73	.85	.76	.64	.54	.25		396
11. Essay Posttest	.32	.37	.56	.53	.61	.54	.47	.50	.21	.56	

Note: Correlations below diagonal, number of cases above.

Table 8

Correlation Matrix for Majority Students in Four Colleges During the 1975-76 Academic Year

Variable Number and Description	Variable Number										
	1	2	3	4	5	6	7	8	9	10	11
1. High School Rank		6457	4904	4904	4904	6484	6484	669	3648	673	658
2. High School English Grade	.57		4991	4991	4991	6603	6603	678	3705	685	667
3. SAT Reading	.41	.36		5073	5073	5073	5073	561	2881	569	554
4. SAT Vocabulary	.38	.32	.74		5073	5073	5073	561	2881	569	554
5. TSWE (SAT)	.44	.40	.65	.63		5073	5073	561	2881	569	554
6. SAT-V	.42	.36	.94	.92	.69		6715	685	3741	691	674
7. SAT-M	.43	.20	.50	.51	.48	.55		685	3741	691	674
8. Essay Pretest	.34	.36	.50	.49	.58	.52	.29		645	605	637
9. College English Grade	.17	.19	.21	.17	.25	.22	.11	.27		659	640
10. TSWE Posttest	.49	.46	.68	.61	.80	.69	.43	.56	.24		627
11. Essay Posttest	.35	.33	.45	.40	.51	.44	.26	.47	.20	.51	

Note: Correlations below diagonal, number of cases above.

Table 9

Correlation Matrix for Minority Students in Four Colleges During the 1975-76 Academic Year

Variable Number and Description	Variable Number										
	1	2	3	4	5	6	7	8	9	10	11
1. High School Rank		818	704	704	704	828	828	129	443	134	128
2. High School English Grade	.51		713	713	713	842	842	130	447	135	129
3. SAT Reading	.17	.24		742	742	742	742	115	387	118	113
4. SAT Vocabulary	.17	.25	.76		742	742	742	115	387	118	113
5. TSWE (SAT)	.21	.32	.70	.70		742	742	115	387	118	113
6. SAT-V	.20	.26	.94	.93	.75		871	134	461	138	132
7. SAT-M	.31	.17	.52	.51	.50	.57		134	461	138	132
8. Essay Pretest	.12	.24	.49	.51	.63	.55	.31		128	116	124
9. College English Grade	.05	.12	.18	.18	.20	.17	.16	.15		132	126
10. TSWE Posttest	.21	.39	.56	.55	.78	.66	.42	.63	.20		119
11. Essay Posttest	.05	.26	.36	.48	.49	.46	.30	.50	.10	.50	

Note: Correlations below diagonal, number of cases above.

or better than the Essay Pretest. There would appear to be no systematic differences in the correlations for the different groups, with the slight differences in correlations probably resulting from sampling differences.

Tables 5, 6, 7, and 8 are also useful for comparing alternate predictors such as high school performance. The correlation between self-reported high school rank and the Essay Posttest was .30 for males, .37 for females, .35 for majorities, and .05 for minorities. (In general, for minorities the high school rank seems to correlate lower with all other variables.) The correlation between high school English grade and Essay Posttest was .26 for males, .37 for females, .33 for majorities, and .26 for minorities. These high school data did not predict college performance as well as the TSWE scores or SAT-V scores (Variable 6). Interestingly, the SAT-M score appears to have predicted college English performance better than self-reported high school data in some cases.

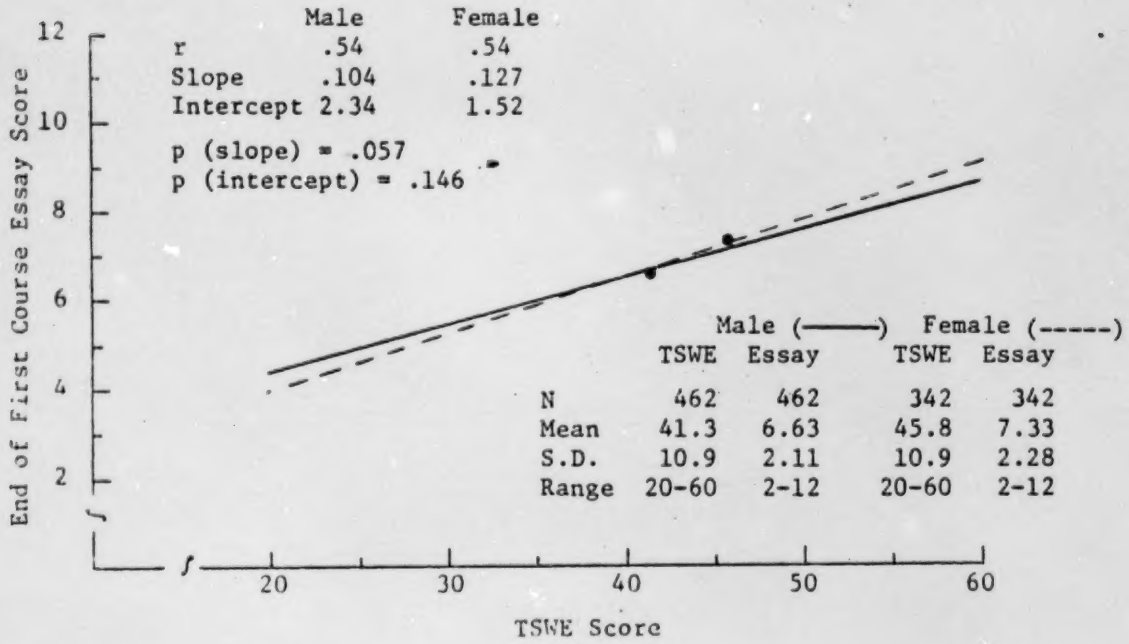
Regression Analyses

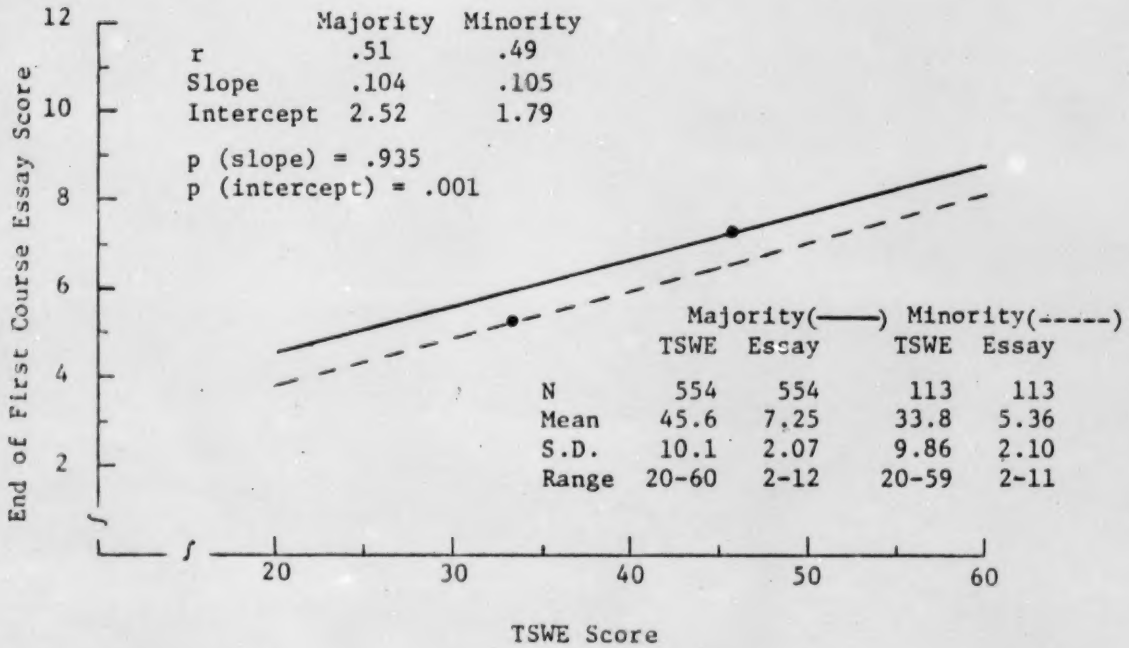
Given the objective essay criterion available for the 1975-76 data, it was of particular interest to compare regressions of the essay on the TSWE scores for the four groups.

Figure 1 shows regression lines comparing males and females (top) and majorities and minorities (bottom). The male-female comparison suggests some real differences in the slopes of the regression lines ($p = .057$), but the difference in the y-intercept does not achieve significance. (These statistical tests were performed using an analysis of covariance procedure similar to that suggested by Gulliksen and Wilks, 1950.) The difference in slopes are clearly not statistically significant ($p = .935$), and the lines appear to be parallel. On the other hand, the

Figure 1

Comparison of Regressions of Essay Scores
on TSWE Scores for Males, Females, Majorities, and Minorities





majority-minority differences in the y-intercept are statistically significant ($p = .001$).

Interpretations of these regression comparisons may be made as follows. If a single regression line were used for both males and females (rather than the separate regression lines shown in Figure 1), an under-prediction would tend to occur for females in the high-ability range and an over-prediction in the low-ability range. That is, high-ability females performed slightly better on actual writing tests than the TSWE would have predicted with a single regression line. Conversely, low-ability females performed slightly worse on actual writing tests than a single regression line would have predicted. If a single regression line were used for both majority and minority students, an over-prediction would occur for minorities at all ability levels. That is, minorities did not perform as well on actual writing tasks as the TSWE would have predicted with a single regression line.

While some of these group differences attain statistical significance, it is doubtful whether they are of practical significance. Scatter-plots of the points through which the regression lines were drawn do not suggest important group differences in the relationship between TSWE scores and writing performance.

Analyses of False-Negatives

The above traditional hit/miss, correlational, and regression analyses do not show any substantial differences operating to the disadvantage of women or minorities. Nevertheless, these traditional analyses may leave some important issues unexplored. For example, Goldman & Widawski (1976) suggest that it is necessary to go beyond hit/miss analyses and to

consider false-positive and false-negative errors. False-positive errors occur when those predicted to succeed, fail, and false-negative errors occur when those predicted to fail, succeed. The sum of false-positive errors and false-negative errors is the number of misses. Although the placement context in which the TSWE is used is not one of selection vs. rejection, it is still of importance to make accurate predictions. Therefore, it is appropriate to pay particular attention to false-negatives; that is, those who were not "selected," but who would have succeeded, had they been. The logic is that a false-negative error is worse than a false-positive error. In the selection context, false-negatives would be denied an education (at a particular institution) even though they could have succeeded if they had been selected. In a placement situation, false-negatives might be placed in a slower section, even though they could have succeeded in a faster section.

Shown below are four-fold tables based on a cut score of 40 with the proportions in each quadrant indicated:

Males (493)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 40	151 .30	102 .21
TSWE < 40	36 .07	204 .41

Females (403)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 40	200 .50	101 .25
TSWE < 40	23 .06	79 .39

Majorities (681)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 40	273 .40	122 .18
TSWE < 40	37 .05	249 .36

Minorities (115)

	Essay 7 to 12	Essay 2 to 6
TSWE ≥ 40	22 .19	11 .10
TSWE < 40	9 .08	73 .63

The small differences that occur for the four groups (.07, .06, .05, .08) could easily have occurred by chance, and--for all four groups--the observed proportion of false-negatives is less than the observed proportion of false-positives.

Summary and Conclusions

Data were collected for a brief objective English test (the TSWE) and for subsequent essay writing performance in four institutions. Data were then pooled across the four institutions and subclassified into four groups: males, females, majorities, and minorities. The groups were then compared with respect to TSWE score distributions, correlations of TSWE scores with later performance in freshman English courses and regressions of essay scores on TSWE scores.

Neither the correlational nor the regression analyses suggested any substantial differences in prediction among the groups. Statistically significant differences were obtained, however, between the slopes of the regression lines for males and females and between the intercepts of the regression lines for majorities and minorities. The regression lines thus indicated that females scoring high on the TSWE tended to write better essays than males scoring high on the TSWE. Conversely, low-scoring females tended to write worse essays than low-scoring males. The majority and minority regression line comparisons indicated that, for the same TSWE score, majorities tended to write better essays than minorities throughout the range of TSWE scores. However, these differences were not of sufficient size to be of any practical significance.

Analyses were also made of hits, misses, false-positive errors, and false-negative errors. False-positive errors occur when a high TSWE score is associated with either a low course grade or a low essay score. False-negative errors occur when a low TSWE score is associated with either a high course grade or a high essay score. Misses consist of the

sum of false-positive and false-negative errors. These analyses were of interest for comparison with recent literature; however, they suggested a lack of generalizability resulting from their dependence upon the cutting score. The correlational and regression analyses offered more generalizable results.

No substantial differences in the optimum cutting scores were observed across groups in the hit/miss analyses or in the false-negative analyses. When viewed in conjunction with the regression analyses, the hit and miss analyses and false-negative analyses suggest that the use of TSWE in placement results in no unfairness to any of the four groups analyzed in this study.

Perhaps the most significant aspect of the study was the use of an objective criterion (a graded essay score) for the comparison of predictive validities of the TSWE for the four groups. Much past research on predictive validity comparisons has been questioned on the grounds that course grades, a subjective criterion, may be biased for or against females or for or against minorities. The use of a blind-scored essay greatly reduces possible biases because the professionals scoring the essays have no contact with nor knowledge of the students who wrote the essays. The study showed that when the possible biases were controlled by the blind-scoring procedure the results were quite similar to results that have been obtained with more subjective criteria such as course grades.

The study was limited to some degree, of course, by the necessity of combining all minorities into one group. Future studies should attempt to focus on single groups. Therefore, sufficient quantities of data should be collected for within-group analysis.

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